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## Northrop Y-12 Site Assessment Summary

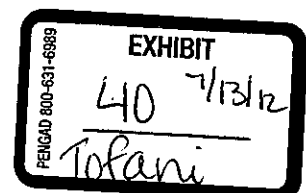
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### Assignment:

1. Review and evaluate the operational history of the Y-12 facility as well as site closure, assessment, and remediation activities with respect to governmental compliance and reasonableness of conduct.
2. As part of Task 1, determine if Y-12 site has contributed to the documented groundwater VOC contamination.
3. Assist in the development, testing, and operation of a groundwater circulation well to mitigate impacts to groundwater while the soil remediation activities are being completed.
4. Respond to allegations or positions taken by Plaintiff experts regarding the issues outlined above, as warranted.

### Scope of Work:

1. Review and evaluation of approximately 16,000 pages of documents pertaining to the Y-12 site operations, environmental investigations, remediation, and monitoring. A chronological summary of the documents that have been reviewed is provided in a site summary report that is bound separately.
2. Review and evaluation of historic aerial photographs of the Y-12 site and surrounding areas. Copies of aerial photographs are provided in the site summary report.



3. Preparation of a site plan of the former Y-12 facility from the available documentation illustrating the locations of the prior improvements or operations, borings, monitoring wells, remedial excavations and soil vapor extraction (SVE) operations, along with soil and soil vapor testing results. A site plan of the former Y-12 facility is provided in the summary report.
4. Preparation of graphs illustrating the measured groundwater VOC levels for the Y-12 site wells and other nearby wells. Copies of these graphs are bound separately.
5. Review of deposition transcripts, and selected trial testimony, of Plaintiff experts Drs. Waddell and Fogg, Steve Tedesco, and Dave Mark.
6. Plotting of historic groundwater monitoring results (VOC levels, inorganic contaminant levels, and piezometric levels), along with local rainfall data, for approximately 66 OCWD monitoring wells, 66 PRP wells, and 33 production wells. These graphs are provided in a separate volume.
7. Preparation of a summary report which describes the site history, operations, documented spills and releases, environmental assessment activities, stratigraphy and hydrology, and site remediation work as well as regulatory involvement and status.
8. Preparation of these summary notes.

### **Observations, Findings, and Conclusions:**

1. The testing results indicate a primary release of TCE occurred in the area of the former quench tank. Based upon the history of TCE and TCA usage, this release likely occurred prior to 1980. The TCE that was released at this location appears to have contained a small percentage of PCE.
2. A secondary, much smaller and more localized release of TCE appears to have occurred in the area of the former wastewater pre-treatment plant on the west side of the building. The secondary release also likely occurred prior to 1980 and contained a small percentage of PCE.

3. The TCE from the primary release infiltrated to the depth of the low permeability, silty / clayey, perched groundwater zone which occurs at approximately 60 feet bgs. The center of the TCE plume migrated towards the west side of the property as it infiltrated into the ground.
4. The TCE from the primary release resulted in a perched groundwater plume (>5X MCL) that extended approximately 500 feet downgradient (west) of the site.
5. The impact of the secondary release on the perched groundwater, if any, was much smaller.
6. The infiltration of TCE-impacted perched groundwater to depth resulted in contamination of the Shallow Aquifer. The resulting plume (>5X MCL) extends approximately 1,500 feet downgradient (west) of the site.
7. The relatively limited extent of the groundwater TCE plume demonstrates that attenuation of the VOCs has taken place - and continues to occur.
8. A release of PCE appears to have occurred on the Trilogy Plumbing property to the west of the Y-12 site. That release also appears to have infiltrated to the depth of the Perched Zone and impacted the Shallow Aquifer.
9. One or more releases of TCA appear to have occurred in the vicinity of the Trilogy Plumbing site and/or the western portion of the Y-12 site. At least one, and possible all of these releases, appear to have occurred on the Trilogy Plumbing property. A printed circuit board manufacturer (AeroScientific) operated at the Trilogy site between 1973 and 1986. EPA records indicate AeroScientific generated between 10,000 and 20,000 lbs. of TCA air emissions per year after they relocated. Accordingly, it is likely that AeroScientific used significant quantities of TCA at the subject property (184 East Liberty Avenue).
10. The Membrane Interface Probe (MIP) testing performed by Ninyo & Moore / Vironex in 2007 indicates one or more VOC sources, and more severe VOC contamination, on the former AeroScientific site.
11. The TCA release(s) appears to have infiltrated to the depth of the Perched Zone and impacted the Shallow Aquifer. The TCA plume within the Perched and Shallow Aquifer zones is no longer present. A relatively

localized DCE plume remains in the Perched Zone from the transformed TCA. There does not appear to be an associated (>5X MCL) DCE plume within the Shallow Aquifer.

12. The Y-12 site is located within a relatively large groundwater plume. Groundwater impacted with PCE, TCE, DCE, and Dioxane flows onto the site from upgradient sources within the Shallow Aquifer zone.
13. The apparent, approximate configuration of the groundwater plumes impacting, or emanating from, the Y-12 site are shown on plume maps prepared separately.
14. An extensive investigation was performed following the closure of the facility under the direction of the RWQCB. The onsite soil contamination, as well as the associated Perched Zone and Shallow Aquifer plumes were investigated and defined to the satisfaction of the RWQCB.
15. The presence and general extent of the VOC-impacted soil in the site vicinity is illustrated by the 2007-2008 soil vapor survey. The results of this survey are illustrated in a series of graphs that are bound separately.
16. A total of 35 groundwater monitoring wells were installed by Northrop consultants in conjunction with this investigation. Monitoring well locations are shown in the site summary report.
17. The groundwater wells have been monitored on more or less a quarterly basis since they were installed. Graphs illustrating the historic VOC levels and groundwater elevations are bound separately.
18. Following the completion of the site characterization activities in 2008, Northrop has been aggressive and proactive with respect to site remediation.
19. An extensive Soil Vapor Extraction (SVE) system has been operated at the site since August of 2008. A Dual Phase Extraction (DPE) system has been operated at the site in conjunction with the SVE system since January of 2009. Both systems have been operated on a near-continuous basis since the time of their installation.

20. The SVE and DPE systems have been highly effective in decontaminating the impacted soils at the site. To date, more than 18,200 lbs. of VOCs have been recovered by these systems. Soil vapor levels have typically been reduced by more than 99% since remediation was initiated. It is estimated that approximately 98% of the VOCs present within the treatment area have been recovered to date.
21. Operation of the SVE and DPE systems will continue under the direction of the RWQCB until the onsite VOC source has effectively been eliminated. It is anticipated that operation of these systems will continue for approximately two years.
22. VOCs from the Y-12 site are continuing to impact the Shallow Aquifer. The level of impact has been reduced at most monitoring locations as a result of the remedial work that has been completed to date. Significant impacts to groundwater will be progressively eliminated as the source removal activities are completed.
23. The TCE levels in most wells located downgradient of Y-12 have fallen significantly. TCE levels are presently much lower than their historic highs in AM-41A, FM-11A, and NMW-7.
24. A groundwater circulation well with an in-casing advanced oxidation system was installed and tested along the western property margin to intercept and destroy VOC-impacted groundwater from the Shallow Aquifer while the soil remediation activities are being completed. The initial treatment approach involved an ozone-peroxide advanced oxidation system. That system was highly effective in destroying dissolved VOCs but it was found to generate an unwanted by-product (bromate).
25. The circulation well was subsequently modified to incorporate a UV-peroxide advanced oxidation system. The modified system has been operated at the site since August of 2011 and has proven to be effective in destroying dissolved VOCs without generating unwanted by-products.

26. Treated groundwater containing bromate from the initial system (at a concentration of 10% or more of the source concentration) extends approximately 2,500 feet downgradient from the Y-12 site. The bromate plume has dissipated, and continues to dissipate. The groundwater bromate levels have dropped below the drinking water MCL for bromate (10 ug/L) in all but two of the area monitoring wells. It is anticipated that the bromate levels within these two remaining wells will drop below the MCL within the next several months.
27. Although unintended, the bromate has provided useful insight into the groundwater flow patterns and velocities at the site.
28. It is anticipated that the groundwater circulation well will continue to be operated under the direction of the RWQCB until the soil remediation activities at the site are completed. The well is centrally located with respect to the Shallow Aquifer sub-plume that emanates from the site. Operation of the well is expected to mitigate the onsite contribution to the Shallow Groundwater plume. The well also intercepts and destroys VOCs that originated from upgradient sites.
29. The investigation and remediation activities that have been performed at the Y-12 site were thorough and extensive. These activities were performed at the direction of, and with the approval of, the RWQCB.
30. Northrop has reimbursed the RWQCB for the costs associated with its oversight.
31. RWQCB personnel are currently satisfied with the scope and progress of the site remediation activities. It is anticipated that the RWQCB will continue to provide oversight until the soil and groundwater remediation activities have been completed to its satisfaction.
32. Northrop has made an effort to interact with, and solicit input from, the OCWD with respect to the onsite groundwater remediation activities. Northrop would like to continue to work with the OCWD in this regard.
33. Northrop has made, and continues to make, a good faith effort to remediate the soil and groundwater contamination at the Y-12 site.

34. Northrop is committed to completing (and obligated to complete) the soil and groundwater remediation activities to the satisfaction of the RWQCB.

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